

JPRS 71920

25 September 1978

TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY  
PHYSICAL SCIENCES AND TECHNOLOGY  
No. 50

**DISTRIBUTION STATEMENT A**  
Approved for Public Release  
Distribution Unlimited

20000412 169

**U. S. JOINT PUBLICATIONS RESEARCH SERVICE**

Reproduced From  
Best Available Copy

U S S R

## NOTE

JPRS publications contain information primarily from foreign newspapers, periodicals and books, but also from news agency transmissions and broadcasts. Materials from foreign-language sources are translated; those from English-language sources are transcribed or reprinted, with the original phrasing and other characteristics retained.

Headlines, editorial reports, and material enclosed in brackets [] are supplied by JPRS. Processing indicators such as [Text] or [Excerpt] in the first line of each item, or following the last line of a brief, indicate how the original information was processed. Where no processing indicator is given, the information was summarized or extracted.

Unfamiliar names rendered phonetically or transliterated are enclosed in parentheses. Words or names preceded by a question mark and enclosed in parentheses were not clear in the original but have been supplied as appropriate in context. Other unattributed parenthetical notes within the body of an item originate with the source. Times within items are as given by source.

The contents of this publication in no way represent the policies, views or attitudes of the U.S. Government.

## PROCUREMENT OF PUBLICATIONS

JPRS publications may be ordered from the National Technical Information Service (NTIS), Springfield, Virginia 22151. In ordering, it is recommended that the JPRS number, title, date and author, if applicable, of publication be cited.

Current JPRS publications are announced in Government Reports Announcements issued semimonthly by the NTIS, and are listed in the Monthly Catalog of U.S. Government Publications issued by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Indexes to this report (by keyword, author, personal names, title and series) are available through Bell & Howell, Old Mansfield Road, Wooster, Ohio, 44691.

Correspondence pertaining to matters other than procurement may be addressed to Joint Publications Research Service, 1000 North Glebe Road, Arlington, Virginia 22201.

Soviet journal articles displaying a copyright notice and included in this report are reproduced and sold by NTIS with permission of the copyright agency of the Soviet Union. Further reproduction of these copyrighted journal articles is prohibited without permission from the copyright agency of the Soviet Union.

<b>BIBLIOGRAPHIC DATA SHEET</b>	1. Report No.	JPRS 71920	2.	3. Recipient's Accession No.
	4. Title and Subtitle TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY - PHYSICAL SCIENCES AND TECHNOLOGY No. 50			5. Report Date 25 September 1978
7. Author(s)			8. Performing Organization Rept. No.	6.
9. Performing Organization Name and Address Joint Publications Research Service 1000 North Glebe Road Arlington, Virginia 22201			10. Project/Task/Work Unit No.	11. Contract/Grant No.
12. Sponsoring Organization Name and Address  As above			13. Type of Report & Period Covered	14.
15. Supplementary Notes				
16. Abstracts  The report contains information on aeronautics; astronomy and astrophysics; atmospheric sciences; chemistry; earth sciences and oceanography; electronics and electrical engineering; energy conversion; materials; mathematical sciences; cybernetics, computers; mechanical, industrial, civil, and marine engineering; methods and equipment; missile technology; navigation, communications, detection, and countermeasures, nuclear science and technology; ordnance; physics; propulsion and fuels; space technology; and scientists and scientific organization in the physical sciences.				
17. Key Words and Document Analysis. 17a. Descriptors USSR                      Electronics                      Missile Technology Aeronautics              Electrical Engineering              Navigation and Astronomy                Energy Conversion                Communications Astrophysics             Materials                      Detection and Atmospheric Sciences    Mathematics                  Countermeasures Chemistry                Mechanical Engineering        Nuclear Science and Computers                Civil Engineering              Technology Cybernetics              Industrial Engineering        Ordnance Earth Sciences            Marine Engineering            Physics Oceanography            Methods                      Propulsion and Fuels 17b. Identifiers/Open-Ended Terms    Equipment                    Space Technology				
17c. COSATI Field/Group 01,03,04,07,08,09,10,11,12,13,14,16,17,18,19,20,21,22				
18. Availability Statement Unlimited Availability Sold by NTIS Springfield, Virginia 22151			19. Security Class (This Report) UNCLASSIFIED	21. No. of Pages 41
			20. Security Class (This Page) UNCLASSIFIED	22. Price PCA 03

TRANSLATIONS ON USSR SCIENCE AND TECHNOLOGY  
PHYSICAL SCIENCES AND TECHNOLOGY

No. 50

## CONTENTS

PAGE

## CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY

- Uzbek Seminar on Increasing Efficiency of Automated Control  
Systems and Computer Technology  
(EKONOMIKA I ZHIZN', May 78) ..... 1

Efficiency Topic of Republic Seminar  
Computers and Automation in Uzbekistan, by K. Akhmedov  
Increased Utilization of Computer Capabilities  
Automated Control on the Sectoral Level  
Automated Control on Higher Levels

- Automation of Design and Construction Projects  
(G. Lastovkin, M. Mel'nikov; LENINGRADSKAYA PRAVDA,  
27 Jul 78) ..... 27

## SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

- Annual General Meeting of the Turkmen SSR Academy of Sciences  
(6 Apr 1978)  
(N.I. Nemirova; IZVESTIYA AKADEMII NAUK TURKMENSKOY  
SSR: SERIYA FIZIKOTEKHNICHESKIKH KHIMICHESKIKH I  
GEOLOGICHESKIKH NAUK, No 3, 1978) ..... 30

## CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY

### UZBEK SEMINAR ON INCREASING EFFICIENCY OF AUTOMATED CONTROL SYSTEMS AND COMPUTER TECHNOLOGY

#### Efficiency Topic of Republic Seminar

Tashkent EKONOMIKA I ZHIZN' in Russian No 5, May 1978 p 63

[Text] As we have already reported, a republic-wide seminar convened by the Central Committee of the Communist Party of Uzbekistan has been held in Tashkent. The seminar dealt with problems of improving the efficiency of automated control systems and computer facilities. Taking part were responsible workers of obkoms and of the Tashkent Gorkom of the Communist Party of Uzbekistan, the directors of ministries, agencies, associations and large industrial enterprises, specialists of computing centers and organizations that develop automated control systems.

The seminar-conference was opened by Secretary of the Central Committee of the Communist Party of Uzbekistan A. U. Salimov. A report "On the Course of Development of Automated Control Systems and Introduction of Computer Technology in the Republic and Measures to Improve Their Efficiency" was given by Deputy Chairman of the Council of Ministers and Chairman of Gosplan, Uzbek SSR, K. A. Akhmedov.

The participants in the seminar exchanged experience on the development, introduction and operation of automated control systems, and talked about the outlook for further development and unsolved problems, and discussed ways to increase the output of automated control systems and the efficiency of utilizing computer equipment. On the basis of these reports and exchange of opinions, recommendations were worked out and passed on improving the efficiency of automated control systems and computer facilities.

In this issue we offer our readers a brief overview of the republic seminar.



Participants in the republic-wide seminar become acquainted with work at the Computer Information Center of Gosplan, Uzbek SSR. B. Abidov is giving the necessary explanations.

COPYRIGHT: "Ekonomika i zhizn'", 1978

## Computers and Automation in Uzbekistan

Tashkent EKONOMIKA I ZHIZHN' in Russian No 5, May 1978 pp 64-68

[Excerpts from article by K. Akhmedov, Deputy Chairman of Council of Ministers, Chairman of Gosplan, Uzbek SSR: "Ways to Improve Efficiency of Automated Control Systems and Computer Equipment"]

[Text] The article was prepared by the author at the request of the editorial staff of the journal on the basis of his report to the Republic Seminar on Increasing Efficiency of Automated Control Systems and Computer Technology. See the report on the seminar in this issue.

In 1971, the only automated control system in Uzbekistan was being set up at the Tashkent Aviation Plant imeni V. P. Chkalov, and about twenty computers were being used only in a few VUZ's and planning and design organizations. Only seven years have passed, and today 97 automated control systems and as many computing centers employing 308 modern computers are working successfully in ministries, agencies, enterprises and organizations of the Uzbek SSR.

Automated control systems are in effective operation in the ministries of power and electrification, geology, the construction materials industry, communications and public health, in the administrations of the Middle Asian Railroad and civil aviation, in the Tashkent Aircraft Production Association imeni V. P. Chkalov, at the Tashsel'mash, Tashkentkabel' and Electronic Equipment plants and in a number of other enterprises.

The first phases of large intersectoral automated systems have been introduced and are in successful operation: a planning calculation system in Gosplan, Uzbek SSR, and a State-wide statistics system in the Central Statistical Administration, Uzbek SSR. Several specialized design and planning organizations have been set up to develop automated control systems of various categories.

The results of work done in the past, including two years of the Tenth Five-Year Plan, convincingly show that with proper organization of the work of automated control systems, they yield an appreciable effect, and are becoming an irreplaceable part of the operation of both administrative agencies and subdivisions directly involved in production.

The quotas on introducing and using automated control systems and computer technology assigned by the Ninth Five-Year Plan and for the first two years of the Tenth Five-Year Plan have been basically met. The overall annual effect from introducing automated control systems and computers in the ministries, agencies, associations and enterprises of the Uzbek SSR comes to more than 50 million rubles, and the payoff period of expenditures is 2.7 years.

In this connection it should be borne in mind that in addition to the economic effect expressed in rubles, automated control systems have a considerable influence on improving the management of all sectors of the national economy, increasing production efficiency, improving quality indices of the work of sectors and enterprises, and it is not nearly always that this is amenable to evaluation in monetary terms.

For example the introduction of an automated control system at the Tashsel'-mash Plant eliminated from circulation the documents filled out by hand, and this has made it possible for engineering personnel to concentrate their attention on more detailed analysis of the state of affairs in production and the making of sound and timely decisions.

As a result, the production volume during the Ninth Five-Year Plan increased by a factor of 1.5 without any increase in the staff of administrative and management personnel.

At one of the nation's largest enterprises in the cable industry -- the Tashkentkabel' Plant -- an automated control system has reduced the idle time of equipment to 2/5 of its former level, accelerated the movement of working capital, and automation of bookkeeping has reduced the accounting staff by 21 employees.

Over recent years in the republic, extensive organizational and engineering steps have been taken that have been conducive to successful and smooth work on setting up automated control systems and introducing computer equipment. A great deal is being done on training personnel for work in computing centers that are already in existence or are to be set up. Departments specializing in cybernetics in VUZ's of the republic are annually graduating 3.5-4 times as many specialists as in 1972. At the Institute for Improving Qualification of Managerial Workers Affiliated with the Council of Ministers of the Uzbek SSR a two-month instructional course on automated control systems is taken by 400 persons per year, and as many as 2000 persons are instructed in numerous departmental courses.

Thus during recent years in Uzbekistan a lot has been done for the utmost expansion of scales of utilization of automated control systems and computer equipment. In this way conditions have been brought about for more efficacious solution of multiple-plan managerial problems, finding optimum ways to increase social production and improve its efficiency, accelerating the pace of scientific and technical progress and introduction of progressive experience.

In addition, there are serious flaws in this important business that are holding back solution of the main problem -- improving the efficiency of automated control systems. There are instances where automated control systems and computing centers are set up without the proper preparation. The directors of ministries and agencies, while spending considerable funds on acquisition of complicated equipment, are not organizing its operation in the direction of solving the most important production problems.



Up until now, not all the automated control systems that we have set up are operating at maximum performance. The automated control systems in the republic ministries of rural construction, the meat and dairy industry, agriculture, Glavtashkentstroy, Uzglavvodstroy and Uzglavstroydrevprom are not in full operation, or are even idle.

For instance in Glavtashkentstroy the automated control system of Trust No 4 has entirely ceased operation, and the automated systems of the Zhilstroy Trust and the Tashkent Housing Construction Combine have been partly shut down. In the Uzglavvodstroy System the development of automated calculations of the calendar planning that had been introduced earlier has practically stopped. Out of seven projects being constructed with the use of automated control systems, monthly calculations are being put out on only two of them. The automated control system at the Tashkent Plant of Ferroconcrete Articles is actually running at an idle since the computer calculations done here are not used in practice, and the factory management is doing duplicate manual calculations. Throughout Uzglavvodstroy less than three percent of the total volume of construction jobs are covered by the automated system of calendar planning, whereas the main administration has spent about two million rubles on development and introduction of the automated control system.

As early as 1975 an automated control system had been put into experimental operation at the Tashkent Production Woodworking Association. However, to this day a number of machine calculations are duplicated here with manual computation.

The automated control systems put into operation in two trusts of the Ministry of Agriculture of the republic are standing idle. And we could give many such examples. It should be emphasized that such an attitude toward an important State matter is not permissible. Under conditions where life demands maximum utilization of all available reserves and possibilities for increasing the efficiency of social production, an urgent problem is the widespread assurance of absolute operation of automated control systems and computing centers in the volume with which they are put into service.

There are also many grave deficiencies in such an important matter as the proper determination and reporting of the economic effect of using automated control systems. It should be emphasized that this is not just a formal question since determination of the rated efficiency of computer equipment is not a goal in itself. After all, the State is investing enormous sums in the development and acquisition of valuable equipment, and evaluation of the return on these expenditures is possible only when the efficiency of the automated control system is reflected in such indices of production activity as increment in volume of the sale of goods, profit due to reduction of non-productive expenditures, reduction of the production cost of goods, increase in volumes of production while maintaining stability or reducing production personnel.

It is gratifying that we have already accumulated some experience in this area. Accounting and reflection of efficiency from introduction of automated control systems and computer equipment have been handled in an exemplary manner at the Tashsel'mash and Tashkentkabel' plants, in the administration of the Middle Asian Railroad and in a number of ministries and agencies. However, this positive experience has not as yet been sufficiently actively disseminated.

Take for example Glavtashkentstroy. A check has shown that the calculated annual economy from introduction of an automated control system on the whole throughout the main administration is in excess of 400,000 rubles; however, this result is not reflected in the indices of plan fulfillment with respect to the production cost of goods and profit. The situation is similar in many ministries and agencies, and it is not by coincidence that the Central Committee of the Communist Party of Uzbekistan and the Council of Ministers of the Republic have asked for a closer check on the actual reflection of the indices of efficiency of operation of automated control systems in reports in ministries, agencies, enterprises and organizations.

Soviet scientists have recently developed a new generation of high-speed computers in the unified Ryad series. There are already 48 such machines in operation in the national economy of the Uzbek SSR. But even the most advanced computer technology cannot give total performance if conditions are not brought about for normal operation. There have been considerable improvements in computer use in recent years. In 1972 the mean daily calendar load for computers of high and medium capacity throughout the republic as a whole was 5.9 hours. This figure has now been increased to 12 hours.

In many organizations of the republic, the figure is still higher. Computer equipment is working practically around the clock in the system of ministries of power and electrification, the construction materials industry, geology, in the Navoiyazot Production Association, at the Tashsel'mash Plant and in some other enterprises.

Notwithstanding, there are still a number of considerable deficiencies in the matter of using computer equipment. In many ministries and agencies of the republic the computer load remains extremely low: in the Ministry of Construction and Operation of Highways of the Uzbek SSR -- 10 hours, in the Ministry of Motor Vehicle Transportation -- from 6 to 9 hours, computer use amounts to 6 hours daily in the ministries of rural construction, the meat and dairy industry, and procurements. In the Ministry of Agriculture of the Republic, the daily computer load does not exceed 2.4 hours.

Such an attitude toward the latest equipment is completely inadmissible. It should be recalled in this connection that computers are among the most expensive of machines. The average cost is 600,000-700,000 rubles, i. e. as much as 300-350 lathes -- the equipment of a large machine building plant. And it costs 100 rubles to operate a third-generation computer for one hour.

Still persistent are cases of prolonged inaction of computer equipment during service. In 1976, due to gross violations of fire safety rules, two high-capacity computers -- a Ryad-20 and a Minsk-22 -- were out of operation for four and a half months in the Ministry of Agriculture of the Republic. Last year a modern computer of the Ryad series stood idle for a long time at the computing center of the Uzbekzoloto Combine.

Here and there the faulty practice continues of acquisition of computer equipment before the room for its installation is made ready. A Ryad computer acquired by the Ministry of Land Reclamation and Water Management remained crated for a year and a half for this reason, and a similar situation kept the computers in boxes for 11 months at Glavtashkentstroy and the Institute of National Economy.

From December 1976 until very recently, computer equipment remained idle at the Ministry of the Ginning Industry of the Uzbek SSR for lack of rooms.

Cases of this kind are endless. An unalterable procedure must be instituted once and for all: by the time the computer is received, the machine room must be completely equipped, specialists must have been trained for using it, and design developments must be at a stage requiring computer solution.

The high responsibility of business managers for efficient use of computers is emphasized by the circumstance that the activation and workload of each computer and all organizations that are computer proprietors are accounted for and systematically checked on a Soviet-wide scale -- there is no such procedure for any other equipment category.

In this connection, the Central Statistical Administration of the Republic plays an especially important part; its functions include yearly confirmation of the monthly plan for computer workload in ministries, agencies and organizations. It is necessary to make certain that the workload plans unconditionally meet the requirements of Soviet-wide standards.

To further improve efficiency in the utilization of computer equipment, in conformity with the resolutions of the Twenty-Fifth Congress of the CPSU a course has been taken in the republic toward setting up large multiple-user computing centers that are called upon to serve ministries, agencies and organizations regardless of their departmental jurisdiction.

Work is also being done on setting up intrasectoral multiple-user computing centers to coordinate the production activity of enterprises and organizations of the same kind. For instance in the Ministry of Motor Vehicle Transportation of the Republic instead of organizing computing centers at each regional motor vehicle trust, multiple-user computing centers are being set up to serve several regions at once. The computing center of the Ministry of the Construction Materials Industry of the Uzbek SSR has taken on the functions of a multiple-user computing center in serving the automated control system of the Akhangarnsk Santeckhlit Plant, where it had previously been planned to have a separate computing center.

In the current five-year plan on the whole, shared use of computing centers will enable a sharp increase in the number of automated control systems while cutting the number of computing centers in half.

An important reserve for appreciably improving the efficiency of automated control systems is a purposeful transition from direct calculations that involve a large number of computer operations to the solution of optimization, balance, multiple-variant, forecasting and other complicated problems aimed at improving management in all sectors of the national economy.

This work is already being done in computing centers of the Ministry of Motor Vehicle Transportation of the Republic, the Ministry of Public Health of the Uzbek SSR, the Soyuzmashkhlopkovodstvo, Sredazkabel' and Uzbekkhlopkomash associations and at Uzgiprovdkhov. The further development of the numerous automated control systems already set up in the republic should take this direction, and this must be taken into consideration by the directors of both design organizations and computing centers.

Another important factor that determines the further increase in efficiency of automated control systems is increasingly wider use for direct control of production processes. By this we mean the automated systems for control of technological processes (ASUTP's) that give high performance with minimum expenditures.

Automated systems for control of technological processes are working with high efficiency on mining-transportation jobs at the Kal'makyr Copper Mine of the Almalyk Mining-Metallurgical Combine on the basis of a specialized computer. This system serves 27 excavators, 10 mine dumps, 10 railroad stations and double-track junctions, three hoppers at the enrichment mill, ensuring optimum interaction of all these subdivisions.

The plan for the Tenth Five-Year Plan calls for setting up 45 ASUTP's on the territory of the republic, or 3.7 times as many as have been set up in the entire preceding five-year plan. Eleven such automated control systems are to be set up in this year alone. These include an automated system for dispatcher control at the Ministry of Power and Electrification of the Uzbek SSR, which will implement and sustain optimum conditions of electric power generation and distribution; an automated system for controlling an electric-arc steel-melting furnace at the Uzbek Metallurgical Plant designed for maintaining conditions of maximum furnace productivity with minimum consumption of electric energy; an automated system for control of technological processes of continuous casting and rolling of copper wire rod at the Tashkentkabel' Plant -- the first facility of this kind either in the Soviet Union or anywhere in the world -- and a number of others.

In addition, work on introducing automated control of technological processes can and should be done on still greater scales, and first of all on continuous cycle production processes and on processes with a high degree of automation.

There is a wide front of work in this area in enterprises of the chemical, petrochemical, oil refining and gas industries, in water management, and in motor vehicle and railroad transportation. A great deal must be done in this area by the workers of computing centers of these sectors and by the corresponding design organizations.

The slogan of the Tenth Five-Year Plan is efficiency and quality. Therefore cybernetics specialists are called upon to make their weighty contribution to solving the problem of improving the quality of goods produced. The job is to make automated systems out of the complex systems for quality control of goods now being developed and put into service.

Valuable experience in this respect has been accumulated by workers in the computing centers of industrial enterprises in L'vov, and in our republic -- at the Tashkent Aircraft Production Association imeni V. P. Chkalov. However, on the whole this work is only beginning here. We must see to it that the subsystem for quality control of goods produced becomes an inseparable component part of every production automated control system.

There are also considerable possibilities for improving the efficiency of automated control systems now being set up in the reduction of expenditures for plan development. Unfortunately, so far the design of automated control systems on the whole throughout the country is an expensive proposition: the expenditures for development of automated control systems in industrial enterprises come to 150,000-200,000 rubles, while the development of a sector-wide automated control system costs 300,000-500,000 rubles.

An important way to reduce expenditures on design work is to use standard design solutions modified for the specific job and with consideration of local conditions. Leading design organizations of the Uzbek SSR are already applying standard solutions to their own developments.

This work is being successfully carried out by the specialized design office of automated control systems affiliated with the Institute of Cybernetics, the Tashkent Design and Planning Office of Automated Control Systems, and an affiliate of the Sredazspetsavtomatika Design and Planning Office of Automated Control Systems. Standard developments are being used to a certain extent in the Sredazkabel' and Uzbektekstil'mash associations, and in the ministries of procurements and public health of the republic. This experience requires the widest possible dissemination so that standard design solutions will become the basis for setting up automated control systems and computing centers in all ministries and agencies, by all design organizations.

To further increase the efficiency of operation of research and design organizations engaged in setting up automated control systems and computing centers, it has been deemed advisable to change them over to new conditions of planning and economic incentive, and also to extend the Regulations on the Socialist State Production Enterprise to computing centers that are on an independent balance.

This means that for the above-mentioned organizations a system of plan indices will be defined to stimulate work depending on efficiency in introducing and operating computer facilities. The implementation of such measures will raise still higher the personal interest of each worker, initiative for attaining the best results in work, and will be conducive to a further improvement in the efficiency of automated control systems and computer facilities in all sectors of the national economy and hence to the further development of production forces of the entire nation and of each Soviet republic.

COPYRIGHT: "Ekonomika i zhizn'", 1978

### Increased Utilization of Computer Capabilities

Tashkent EKONOMIKA I ZHIZN' in Russian No 5, May 1978 pp 69-72

[Text] The scales of using modern computer equipment in all areas of the national economy are expanding at a truly headlong pace. Over the last seven years the number of computers in the Uzbek SSR has increased by a factor of more than 15, and the number of automated control systems already set up or being set up on this basis in different categories has increased by a factor of nearly a hundred. We can really say that automated control systems have become a sign of the times, an irreplaceable part of scientific and technical progress.

Typically, the workers of enterprises and associations where automated control systems are in operation today simply cannot conceive of their activity without their faithful helper -- the computer. Experience convincingly shows that the attainment of the present level of production volume in many industrial enterprises and associations has been possible to a considerable extent thanks to the introduction of automated control systems that use computer facilities.

This was the topic in particular of a report to the Seminar by Kh. R. Alimov, Director General of the Sredazkabel' Association.

The Tashkentskabel' Plant is one of the largest enterprises of the cable industry in the nation. Its product list includes about 4000 different wire and cable items that are supplied to more than 11,000 customers that are located in almost all parts of the Soviet Union and abroad. The plant typically has high material inputs and frequent changes in the sizes of items produced.

Under these conditions, increasing production volumes and improving efficiency have added to the agenda the necessity for a radical improvement in enterprise management.

Tashkentskabel' is the first in the republic to use an all-round systems approach to the development and introduction of automated control systems. This means that work is being done in parallel in three areas -- automation of production control processes and technological processes is being combined with scientific-technical and socio-economic development.

The automated enterprise management system (ASUP) at the plant covers a whole range of problems in planning, monitoring, analysis and real-time regulation of the course of production. Automation of management of material and technical supply has enabled introduction of precise accounting and supervision of the incoming material goods in warehouses and their consumption by the main production departments. As a result, the idle time of equipment due to lack of material has been reduced by a factor of 2.5, and excess inventory has been reduced by more than two million rubles.

Realization of "ASU-sales" jobs provides timely information on the arrival of finished goods in warehouses, loading off and leftovers, enabling real-time action on meeting the delivery quota. Thanks to this there has been a sharp reduction in penalties for shortages in meeting customer orders.

The introduction of the "ASU-finances" has accelerated the turnover of working capital and on this account has liberated nearly 2.5 million rubles, and realization of "ASU-bookkeeping accounting" jobs has enabled centralization of bookkeeping and reduced the accounting staff by 21 workers.

Tashkentkabel' is the first, not only in Soviet practice but in the entire world, to set up an automated system for control of the technological process of continuous casting and rolling of copper wire rod. The purpose of this ASUTP is to provide centralized monitoring of 80 parameters of continuous casting and rolling; calculations of technical-economic indices (consumption of electric power, water, materials, labor inputs per unit of production); stabilization of process parameters; control of temperature conditions; control in emergency situations.

Introduction of the ASUTP will sharply increase the quality of wire rod, which makes up almost nine percent of the total volume of goods produced. In addition, it will become possible to produce wire rod suitable for making wire of the thinnest cross sections, heavy manual operations will be eliminated, working conditions will be improved, and labor productivity will be increased by 20%. The anticipated economic effect from using an automated control system in this complicated technological process will amount to 120,000 rubles per year.

In successful operation at the Tashkentkabel' Plant is an automated system for control of scientific-technical and socio-economic development of the enterprise (ASU-NTSER). This system includes a range of jobs on collecting and processing data concerning scientific-technical advances and progressive experience, on setting up a data file -- "idea bank" -- evaluating and analyzing the actual level of production, selecting the optimum version of the comprehensive plan of development, and also jobs of continuous supervision of the implementation of measures and calculation of the coefficient of operativeness of executives.

Introduction of the ASU-NTSER has enabled a considerable improvement in the efficiency and quality of the work of the administrative management system.

In 1972 the production volume per management worker was a little more than 113,000 rubles. In 1977 the figure had risen to 148,000 rubles. In many ways the system is conducive to bringing about favorable conditions for work and life among the members of the collective: the problem of children's pre-school institutions has been solved, the housing situation has been greatly improved, the level of education of workers in the enterprise has been raised, and as a result of all this there has been a sharp reduction in personnel turnover.

The speaker emphasized in particular that improvement of operation of the automated control system at the plant is the result of a fruitful union of science and production. In the course of 15 years of creative cooperation between the Tashkentkabel' collective and scientists of the Institute of Cybernetics with Computing Center of the Academy of Sciences of the Uzbek SSR a number of studies have been done on improving the management system at the enterprise. And this cooperation has not stopped, for creation of the automated control system at the plant and its further development goes on.

Experience in the introduction of automated control systems in enterprises of the Soyuzmashkhlopkovodstvo All-Union Industrial Association was the topic of a talk by I. P. Velikiy, chief engineer of the association.

The variety of product lines, complexity and dynamism of production in agricultural machine building make it a complicated job to control production. Therefore the work on automating the principal functions of management is being done in all eight enterprises that make up the association. The automated control system in the Tashsel'mash Plant was completed in the Ninth Five-Year Plan. This system, which is made up of five subsystems, regularly handles the principal jobs of production and business activity, in particular the functions of planning, accounting, supervision and economic analysis. The return from this automated control system is 460,000 rubles per year.

The automated control system for the Tashkent Tractor Plant is in the stage of realization of the manufacturing plan. Its ten subsystems cover solution of about a hundred problems in planning, accounting and supervision. The expected economic effect from introduction of the system is 2.5 million rubles.

In 1976 the first phase of the "ASU-Soyuzmashkhlopkovodstvo" automated control system was put into industrial service, and work is now continuing on its further development, in particular on automating jobs of planning and operational management of coordinated deliveries and sales, and optimization of multilevel current and long-range planning. The return from the first phase of the automated control system of the association is estimated at 810,000 rubles.

Work has started on automated systems for planning and management in the Tekhnolog Scientific Production Association for Automation and Mechanization of the Production of Machines for Cotton Growing.



Accumulated experience enables us to distinguish the principal areas of improvement of efficiency of automated control systems and computer facilities. One such area is in setting up multiple-user computing centers and functional specialization of such centers on clearly defined problems of a single type. Three such centers will be organized in the association: at the Tashsel'mash Plant, the Uzbeksel'mash Plant and the Tashkent Tractor Plant.

Since any stable group of subscribers (enterprises) requires specialized hardware and software servicing, specialized data banks are set up at the multiple-user computing center. The formation of such data banks will appreciably reduce expenditures on software creation. Besides, they are undoubtedly more reliable and economical in operation than universal software.

Without the organization and specialization of multiple-user computing centers, the association would have to set up a main computing center equipped with several high-capacity machines in addition to the computing centers in the enterprises for dynamic solution of problems of management, coordination and redistribution of material and financial resources. Besides, it would be necessary to set up a system for collecting, receiving, checking and processing information. All this would lead to a considerable increase in the cost of the automated control system and would drag out the time for developing it. But the reduction of expenditures on setting up automated control systems and efficient use of the machines on hand in the computing center constitute the main condition of efficient operation of such systems.

Among the reasons for an inadequate return from expensive computer equipment are organizational deficiencies.

A. L. Vishnevskiy, chief of the computing center at Tashkent Aircraft Production Association imeni V. P. Chkalov, shared experience in improving the efficiency and quality of operation of a computing center.

The collective of this center has a strong record of active service. The computing center of the aircraft plant is one of the first in the republic. The workers of the center have given undeniable service in setting up and introducing the system for automated control of the enterprise. The computing center is not just the technical base of any automated control system. It is the "brain" of the system, the tool without which any automated control system would be inconceivable. Therefore the efficiency of the automated control system depends to a great extent on the high-quality operation of the "brain center" as well. And as prompted by practice, this can be achieved by improving the planning and organization of jobs in the computing center, as well as methods of handling primary documentation, improving the quality of technological processes, programs, computer output data and maximum loading of machines. This center is the first in the republic to begin the practice of submitting computer programs necessary for solving problems of the automated control system for awards of the plant's Emblem of Quality. To date, the Emblem of Quality has been granted to more than 30% of all the programs developed by the computing center.

A very important part is also played by such factors as culture of production, popularization of progressive methods and initiatives, organization of effective socialist competition and indoctrination work in the collective, and finally, a well thought-out system of material incentives for work results. And in this connection, the basis for such a system is a clearly defined quantitative and qualitative evaluation of the work of each person in points. The sum of these points is the criterion for determining the amount of awards for meeting and overfulfilling weekly and monthly quotas. (In a coming issue of our journal we will print an article by A. L. Vishnevskiy telling in more detail about experience in planning and organization of work in the computing center.)

Everyone knows how important it is to make efficient use of water resources under the conditions of our republic, particularly during the agricultural growing season. The fate of the harvest depends to a great extent on the rational distribution of water in the irrigation network.

G. A. Tagiyev, chief engineer at the computing center of the Samarkand Regional Administration of Irrigation Systems talked about setting up the first phase of the "ASU-Zarafshan" automated control system.

The total length of the irrigation system in the Uzbekistan zone of the Zarafshan River is more than 15,000 km. In addition, there are more than 1600 canal-fed basins of various capacities in the Samarkandskaya and Bukharskaya oblasts. It is very difficult to control this complicated system in connection with the continual variability of a great many factors. Up until now, the main criteria taken as the basis for water distribution in the Zarafshan Valley have been the planned demand for water, the average long-term runoff of the Zarafshan River, the monthly forecast of runoff provided by the State-Wide Weather Service, the quality characteristics of the irrigation network, the volume of water in the Kattakurgan Reservoir that acts as a runoff regulator.

However, with such traditional methods of regulating water distribution it is practically impossible to solve the problem of planned control of the water conditions of the soil and to optimize the matching of water supply with vegetation requirements in time in view of the random nature of runoff of the Zarafshan River, the uncontrollable runoff of mountain streams and miscalculations in control of the Amu-Bukhara Canal.

Since the main figure in operational control of a water distribution system is the dispatcher, and a great deal depends on his forknowledge of the course of development of the system, it becomes necessary to provide him with complete information.

The distinguishing features of the irrigation system have had a considerable effect on organization of the collection and transmission of information in the "ASU-Zarafshan" system, and also on the structure and form of the data bank. These features include: territorial disconnectedness of objects,

fluctuation of volumes of information in time, large numbers of sources of information with a comparatively small volume of information at each point. We should add to this the necessity for storing large data files in the form of requisitions, certificates and reports. Only third-generation computers can deal with such a large data flow. Indeed, such a machine is the basis of the automated control system that is being set up.

The automated system realizes the mode of computer-dispatcher dialogs, enabling a person to implement a solution given by the machine at his own discretion in case of necessity. It is the dispatcher's right at any given instant to alter the plan of operation of the entire system, correcting short-range forecast data with respect to the actual runoff of the river, and also to determine the size of the main weirs in one or more mainline canals throughout the planning period. It is also within his jurisdiction to make operational decisions on changing the daily schedule of the Kattakurgan Reservoir on the basis of a dispatcher schedule calculated for each planning interval.

Since the dispatcher has the main job in the "ASU-Zarafshan" system, the broad outlines of the control structure have remained unchanged.

The lower level of the control system is the territorial administration of irrigation systems and the administration of interterritorial canals. The subsequent level is the oblast administration and the Zarafshan Valley Administration of irrigation systems with computing center.

In 1977, experimental-industrial tests were done on several groups of jobs. The main thrust was on analyzing the problems of forecasting runoff and compiling a plan for water demand. Comprehensive experimental-industrial operation of the first phase of the system was started this year.

COPYRIGHT: "Ekonomika i zhizn'", 1978

#### Automated Control on the Sectoral Level

Tashkent EKONOMIKA I ZHIZN' in Russian No 5, May 1978 pp 72-74

[Text] Organization of efficient management is a complicated job even on the enterprise level. Such organization grows into a serious problem when the object of management is an entire sector of the national economy. The method of developing and introducing automated control systems in sectors of industry has a fairly sound theoretical basis. Valuable practical experience has also been accumulated in setting up highly effective sector-wide automated control systems.

The "ASU-Minenergo UzSSR" system is the first automated control system to be put into industrial service in the power sector of the nation. To give an idea of the complexity of this work, we cite a few figures that characterize the scales of the Uzbek power system. It serves nine fossil-fuel and 69 hydroelectric plants, 582 substations, nearly 32,800 transformer points, about 130,000 km of power transmission lines, and also all industrial,

agricultural, communal and domestic customers (a total of more than three million). Power facilities are operated by 29 enterprises, as well as two construction trusts and 13 mechanized movable towers, a central repair enterprise, an enterprise for repair of electrical facilities, Uzenergosbyt and the central cost-accounting base of material-technical servicing.



An automated subsystem of dispatcher control is in operation in the Ministry of Power and Electrification of the Uzbek SSR. At the end of the workday, information on the results of operation of the Uzbek Power System is fed to a computer for statistical analysis. At the start of the next day the directorate gets a summary of the operation of the power system for the preceding 24 hours, where data are presented in a form convenient for analysis on the state of equipment, fulfillment of quotas for production of electric power, specific fuel consumption per kilowatt-hour, and trends of increasing or decreasing power production. The automated subsystem of dispatcher control has a considerable effect since it enables optimization of processes of load distribution among power plants, and reduction of losses in networks. In the photograph: the computing center of the ministry. At the machine is operator L. Isayeva.

The chief of the computing center of the ministry, P. N. Suleymanov, spoke of the effectiveness of the "ASU-Minergo UzSSR" system and possibilities for improving effectiveness.

At present, the "ASU-Minenergo UzSSR" system is comprised of two main component parts: the ASDU (automated dispatcher control system) and the ASOU (automated system for organizational and economic management). The principal

economic effect of the automated control system (about two million rubles per year) results from ASDU problem solution, mainly from optimization of processes of load distribution among electric power plants, and the reduction of network losses.

Expenditures on fuel make up about 70% of the production cost of electric power, and continual analysis of the use of fuel helps to reveal cases of reduced efficiency of equipment or deviations of fuel consumption from the norm per kilowatt-hour due to improper operation of the power plant by working personnel. Such an analysis of technical-economic indices is done each day within the framework of the automated control system on many fossil-fuel plants in the power system, which now account for more than 90% of all the electric power produced. To increase immediacy of analysis, all large fossil-fuel plants are equipped with teletypewriters, and information is exchanged with the computing center by telegraph.

Even now, fuel savings amount to more than 250,000 rubles per year as a result of calculation and analysis of technical-economic indices of equipment operation in fossil-fuel power plants and in the power system as a whole.

On the whole, the performance of the "ASU-Minenergo UzSSR" system is high, but it can be improved still more. P. N. Suleymanov enumerates the main areas for improving the efficiency of the sector-wide system. The first is an increase in the number of problems handled within the framework of the automated control system, and improvement of their quality. However, there are still considerable difficulties on this path. The fact is that many programs developed by design institutes as standard programs suffer from serious deficiencies: unsatisfactory checking of initial information and the intermediate results of calculation, orientation toward a certain sector, enterprise, or specific methods and procedures, etc.

An urgent job is the standardization of input documents, and the codes for indices, documents, materials and so forth that are common to all sectors of the national economy.

Methods and procedures for carrying out the functions of calculation and accounting need standardization. For instance at the present time about 20 methods have been compiled for calculating electric power utility rates, as well as several methods of accounting for material values, calculating average wage payment, and technical-economic analysis of the indices of operation of electric power plants. As a result, all power systems have been forced to develop their own programs, and instead of introducing standard design solutions, we are diffusing the forces of programmers in duplicating one another's work.

Furthermore, computer facilities must be improved to utilize powerful immediate-access systems that increase labor productivity of programmers and enable more efficient use of machine processor.

Finally, one of the reserves for improving performance of automated control systems is the extensive introduction of technical facilities that give a machine-readable copy of information directly at the point of origin, suitable for teletype transmission to the computer. This will sharply reduce the volume of manual work with information, and will be conducive to centralization of control functions (standardization, analysis, planning and accounting).

T. Kh. Tashpulatov, first vice-minister of the construction materials industry of the Uzbek SSR, talked to the participants at the seminar about the comprehensive organization of work on setting up another sector-wide automated control system.

In accordance with the assignments of the national economic plan in the construction materials industry of the republic, automated systems are being developed for various levels of management, including automated systems for control of technological processes of adjusting the raw material and pulverizing cement at the Akhangaran and Navoiy cement plants; automated control systems in enterprises of the Akhangaran Industrial Complex; at the Santeckhlit Plant and in the Stroyplastmass and cement-slate combines; an automated control system for the entire sector.

Presently in operation within the framework of the sector-wide automated control system is a complex consisting of six subsystems, 78 jobs, 134 output forms. Nearly all the economic information of major importance in the sector now passes through computing centers and is processed by computers. The managerial and intermediate staff in the administrative machinery of the ministry and associations get the necessary accounting and analytical data from computer-information centers.

The first phase of the "ASUP-Akhangaran" automated enterprise management system is to go into operation in late 1979. However, as early as October 1976 a job complex for the automated enterprise management system of the Santeckhlit Plant was introduced as an experiment on the basis of the technical facilities of the ministry. Information on the production and business activity of the enterprise for the day is teletyped at night to Tashkent, processed at the computer information center and returned to the plant. In this way, the managerial machinery of the plant at the beginning of the workday have all necessary information on the preceding day's work of the enterprise. This experiment has great practical significance. Its successful implementation has suggested the idea of dropping plans for setting up a multiple-user computing center in Akhangaran, which would have required considerable capital investments, and in line with progressive trends in organizing the use of computers, success in this experiment has enabled conversion of the ministry's computer information center to a multiple-user sector-wide computing center.

At Akhangaran's Santeckhlit Plant, Stroyplastmass and the cement-shale combine, the job complexes of the "Operational Management" and "Material Supply"

subsystems are in industrial service, and in addition a "Production Sales Management" subsystem is in operation in the two former enterprises.

An "Operator Adviser" system was introduced at the Navoiy Cement Plant in 1977, and a start has been made this year on introduction of automated systems for control of technological processes of preparing the mixture of raw materials and pulverizing the raw material in total volume.

The economic effect from introducing comprehensive organization of jobs on setting up automated control systems in the construction materials industry amounted to 482,000 rubles per year. There has been a considerable reduction in the planned duration and deadlines of development, the volume of capital investments, the payoff period and specific overhead expenditures.

Thus the experience accumulated in the republic convincingly shows that automated control systems using computer technology and mathematical economics methods today constitute an important way to perfect management in sectors under conditions of continuing increase in information flow due to the rising number of control objects and increased production volume.

COPYRIGHT: "Ekonomika i zhizn'", 1978

#### Automated Control on Higher Levels

Tashkent EKONOMIKA I ZHIZN' in Russian No 5, May 1978 pp 75-78

[Text] The resolutions of the Twenty-Fifth Congress of the CPSU once more emphasize the necessity of "ensuring further development and improving the efficiency of automated control systems and computing centers, gradually uniting them into a unified State-wide system to collect and process information for accounting, planning and management."

An organic component part of this unified system [the OGAS system] is the republic-wide automated system for management of the national economy [RASU] being set up in the Uzbek SSR. Side by side with the sector-wide automated control system on the upper level of the RASU are large intersectoral automated control systems: for plan calculations in the Gosplan of the republic, for State statistics in the Central Statistical Administration of the Uzbek SSR, for management of material supply in Glavsnab UzSSR.

Deputy Chief of the Central Statistical Administration of the Uzbek SSR, A. S. Ismailov, talked about the course of work on setting up an automated system of State statistics [ASGS] and the outlook for its development.

The first phase of the system was put into operation as early as 1975, and the subsystems and jobs of the second phase are now being worked out and introduced. The effectiveness of the first phase of the ASGS has been roughly evaluated from three important indices: increase in volumes of statistical information, reduction in the cost of processing this information, reduction in the number of personnel in statistical agencies. According to these calculations, the conditional economy from introducing job complexes of the first phase of the system has been 48,200 rubles per year.

The ASGS is a reference information system for collecting, processing, storing, transmitting and printing reliable information necessary for State management agencies. This information is the basis for making decisions to take action on individual processes of social production, for developing plans and forecasts of the national economy of the republic, and also meeting the requirements of Soviet agencies.

Efficient operation of the ASGS requires conjunction with an automated system of plan calculations, the automated control systems of ministries and agencies, and also automated enterprise management systems. Clearly defined interaction must be set between the ASGS and all these systems based on rational division of labor and maximization of the effect on the national economy.

V. V. Rybakov, deputy chief of Glavsnab UzSSR, talked about using computer equipment in the system of material and technical supply.

The aggregate of agencies of material and technical supply of the republic can be categorized as a complicated economic system that performs intersectoral functions on a republic-wide scale involving more than 8,000 consumers in Uzbekistan and nearly 3,000 suppliers situated throughout the territory of the Soviet Union. Glavsnab UzSSR provides the national economy of the republic with material and technical resources in 12,000 consolidated descriptions and more than four million specification descriptions of the most diverse goods in the production-technical category. One can imagine what enormous flows of information circulate in this system. It has already become impossible to handle these masses of data without the aid of computer facilities, and in 1973 the Republic Computing Center of Glavsnab UzSSR was set up with two Minsk-32 computers.

Today most of the payment-dispatch documents and bookkeeping-accounting information are handled by mechanized methods. Computers provide the organizations of Glavsnab UzSSR with more than 70 output working records.

In connection with the complicated organizational structure of the agencies of material and technical supply, as well as the considerable volumes of data to be processed and the peculiarities of information flows, it has been decided to concentrate efforts on bringing about conditions for introducing mathematical economics methods on narrow sections, but with coverage of all planning and economic functions performed by the subdivisions of Glavsnab UzSSR.

In accordance with the general plan, subsystems of the automated control system of Glavsnab are being set up in the republic on the level of specialized "Uzglvasnabsbyts" that are the main link in planning and organizing the provision of material and technical resources for the national economy. The development and introduction of such subsystems is currently being handled in two main administrations -- Uzglavkhimsnabsbyt and Uzglavmetalloznabsbyt.



In the first of these subsystems, called "ASU-Khim," provision has been made for introducing six large interrelated job complexes. These include a complex of planning jobs (in physical terms); planning of technical-economic indices; operational planning and accounting with respect to republic and oblast bases; accounting and supervising the implementation of resources, financial-business activity and bookkeeping. Since the agencies of material and technical supply have no practical experience in developing systems of this kind, it is fairly difficult to determine its effectiveness on the whole at the given stage. For that reason, this effect is being determined for now on the level of individual complexes. In particular, the handling of the complex of planning jobs is expected to save 266,000 rubles, including about 100,000 rubles just for improvement in planning the operation of bases for supply and everyday services and reduction of excess inventories.

In addition, the introduction of this job complex will enable assignment of as many as 8,000 consumers to 600 supply enterprises in 40,000 descriptions of assorted chemical goods, and will also determine the size of inventories on the bases, selection of the form of supply, optimization of consumer-supplier relations and transmittal of as many as 12,000 authorizations and cancellations for delivery of chemical and rubber goods.

As decision processes are worked out in the individual complexes of the automated control systems in the two mentioned main administrations, they will be "bound" as typical complexes to other specialized supply and sales organizations.

V. V. Rybakov feels that one of the most important reserves for increasing the efficiency of computer equipment is to reduce expenses for all operations involving transfer of information to machine media. This can be achieved by extensive utilization of small computer equipment for handling ongoing operational problems with simultaneous production of the information on machine media. However, unfortunately this technique is not used much here.

Problems of improving efficiency and raising the scientific and technical level of automated control systems were discussed in a report by S. A. Salimov who is the director of the Tashkent Planning and Design Office for Automated Control Systems.

Based on an economic analysis of the activity of automated control systems in operation in the republic, he pointed out a number of factors that influence a reduction in their efficiency. These include miscalculations in plans, defects in planning and managing the development of automated control systems, and finally, errors that are made in the stage of operation. Of course as the director of a large specialized planning and design organization on developing automated control systems S. A. Salimov gave most of his attention to job organization in planning and design offices and steps to improve it. (Without going into detail on this report, we refer the interested reader to issue No 4 of our journal for this year, where we printed an article by S. Salimov: "Economic Effectiveness of Automated Control Systems.")

Of considerable interest to participants in the seminar was a report by S. V. Kudryavtsev, second secretary of the Central Committee of the Leninist Communist Youth League [LCYL] of Uzbekistan. All previous speakers had talked chiefly about the performance of automated control systems in the national economy. Kudryavtsev brought up the topic of efficiency in the use of computer facilities in planning and management of social processes, and in particular in the activity of mass social organizations. The first, but very hopeful steps have been taken in this direction in our republic. Some experience has already been accumulated on using computers in the activity of the republic's Komsomol organization.

For instance the co-workers of the Central Committee of the LCYL of Uzbekistan in cooperation with young scientists of the Institute of Cybernetics with computing center of the Academy of Sciences, Uzbek SSR, the Ministry of the Construction Materials Industry and the Ministry of Power and Electrification of the republic have verified programs for computer solution of problems of accounting and analysis of Komsomol personnel as well as compiling an annual statistical report on the quantitative and qualitative makeup of the republic's two-million-strong Komsomol organization.

It is difficult, and at times simply impossible to evaluate the effect in rubles of using computer equipment to improve the operation of social organizations. But the final, or as cyberneticists say the indirect return from using computers in the social sphere promises to be fairly considerable. (At the request of the editorial staff, S. V. Kudryavtsev has prepared an article on this subject for our journal. It will be printed in one of the upcoming issues).

The republic-wide automated control system should, figuratively speaking, crown the complete automation of functions of planning and management on all levels and in all spheres of the economic and social life of Uzbekistan. The job of setting up such a system is extremely complicated. It should be noted that the RASU must combine, interface and provide ideal interaction among hundreds of automated systems of different levels and purposes now in operation and being set up.

Academician V. K. Kabulov of the Academy of Sciences of Uzbekistan, the director of the Institute of Cybernetics with computing center, Academy of Sciences Uzbek SSR, and the chief director of work on the RASU, talked about the state of the development of the system and its future prospects.

The Interdepartmental Council on Improving Management of the National Economy of the Uzbek SSR has approved the draft and engineering plans for the RASU. The draft plan outlines the fundamental principles of operation of the system, defines information volumes and flows, and gives the structure of automated data banks. All mathematical models are written out and the volumes of the information flows are more precisely defined in the engineering plan.

In accordance with calculations done on the draft plan stage, territorial and sectoral multiple-user computing centers will be in operation in the republic,

and on the upper level -- a base multiple-user computing center of Gosplan UzSSR. This will enable effective and rational use of the republic's computers.

Further development of the RASU as an integrated system will take the path of organic combination of the sector-wide automated control systems with territorial complexes. The Gosplan-enterprise-sector-territory-Gosplan circuit will really have to be closed since otherwise there can be no assurance of a smooth, uninterrupted exchange of information.

To do this, it is necessary to speed up work on setting up territorial systems in oblasts of the republic, with special emphasis on compiling plans of socioeconomic development. Within the framework of these systems, solutions are being found for the most important problems that involve coordination of sectoral and territorial principles of planning and management of the national economy.

The makeup of the RASU includes systems of economic and social planning, control of technological processes, and management of planning, design and research. Comprehensive coordination of all component parts of the RASU is one of the important factors in improving the efficiency of automated control systems.

Another direction for improving the efficiency of automated control systems is large-scale automation of the collection, transmission, processing and output of information. For the time being, however, all computing centers of the republic are involved only in automation of data processing.

Large-scale automation of the processing of information flows requires the design and manufacture of a considerable amount of nonstandard equipment: sensors, converters, specialized computers and so forth. Consequently, on the concluding stage of setting up the RASU it is necessary to ensure organic combination of fundamental and applied research in the field of cybernetics, as well as experimental design work and production of non-standard equipment. Successful solution of this problem is possible only within the framework of a large scientific production association. The problem of setting up such an association -- "Kibernetika" -- has in principle already been resolved. In this connection, consideration is also being given to the problem of organizing experimental production for making, installing and operating nonstandard equipment that is required in the facilities to be developed by the association.

In Academician Kabulov's opinion, implementation of jobs to improve the efficiency of automated control systems requires resolution of the following problems:

an appreciable increase in the role of computer information centers, transforming them into storehouses and suppliers of the information necessary for operation of an automated system;

setting up affiliates of the Institute of Cybernetics with computing center of the Academy of Sciences of the Uzbek SSR and the Computer Information Center of Gosplan, Uzbek SSR for development of territorial automated control systems and their implementation;

accelerating the creation of a multiple-user computing center in Tashkent, beginning the planning of a computer complex for this center;

accelerating the creation and utmost promotion of establishment of the Uzbek Kibernetika Scientific-Production Association.

At the present time, a kind of micromodel of the RASU -- the "ASU-Tashkent" -- is being set up. Actually, this automated system should, according to plan, cover all enterprises within the city, and in addition the spheres of construction, everyday and medical services to the population, municipal services, urban transportation, communications, trade and so on.

A report was given on the course of development of "ASU-Tashkent" by V. A. Kazimov, chairman of the Tashkent gorispolkom. (The editorial staff has an article on this topic by V. Kazimov, which will be printed in the journal.)

The branching network of computing centers of different levels will not provide the technical basis for the RASU unless they are provided with reliable communications. The Deputy Minister of Communications of the Uzbek SSR, A. Kh. Inoyatov, talked about the course of development of the data transmission network in the republic.

The republic-wide data transmission network is an organizational and engineering aggregate of communication facilities, and is designed for interaction of computing centers with each other and with subscribers. A general plan of the communications network for the RASU has been developed, according to which it will be set up in two stages. On the first stage, low-speed communication will be organized over existing telegraph channels with the use of necessary equipment. This will provide the RASU with a data transmission network as early as 1985. On the second stage, the capacity of the network is to be increased by using medium-speed communication channels and also centers for commutation of messages with computers.

Data transmission is a new kind of communication that has not been used in the republic. Setting up this kind of communication is a labor-consuming and expensive proposition since considerable capital investments will be needed for building the necessary structures and acquiring hardware. It is A. Kh. Inoyatov's opinion that acceleration of work on setting up the data transmission network for automated control systems should be done by borrowing the experience of some other Soviet republics such as Belorussia and Georgia, where all interested ministries and agencies were invited to take part in setting up the communication lines on a share basis. This brought about a considerable increase in capital investments of the republic ministries of

communications for these purposes. It is felt that the same path should be taken in Uzbekistan as well.

\* \* \*

Participants in the republic seminar-conference passed recommendations on improving the efficiency of automated control systems and computer equipment. Excerpts from these recommendations are given below.

From the Recommendations of the Republic Seminar on Increasing Efficiency of Automated Control Systems and Computer Technology

For purposes of increasing the efficiency of automated control systems and the use of computer equipment in the republic, the seminar-conference considers it necessary to concentrate future work of ministries, agencies, associations, enterprises and organizations on the following main areas:

ensuring unconditional reflection of effectiveness from introducing automated control systems in such plan indices as increment in volume of sale of goods, reduction of the production cost of goods, increased profit, reduction or stabilization of the numbers of managerial personnel with increased production volume, reduction of the turnover rate of working capital and others;

for purposes of further increasing the workload of computers, to set up multiple-user computing centers in the sectors of the national economy of the republic to serve several enterprises and organizations of the same kind instead of setting up computing centers for each enterprise separately;

ensuring timely preparation of production areas, specialists and software for smooth introduction and operation of computers and all auxiliary equipment;

implementing specific measures to ensure loading of computers at least up to the Soviet standards;

setting up automated systems for control of technological processes that yield a high effect with minimum expenditures, particularly in technological processes with a continuous production cycle and also in processes with a high degree of automation;

for purposes of shortening the time required to set up automated control systems and reducing the cost of design work, to make wider use of standard design solutions and applied program packages;

in addition to doing direct calculations involving execution of large numbers of computer operations, to make a general transition to solution of optimization, balance, multiple-variant and forecast problems;

introducing a subsystem for quality control of goods produced in the production automated control systems now set up and in the process of being set up;

for purposes of ensuring interaction of automated control systems now set up and in the process of being set up, in cooperation with the Ministry of Communications of the Uzbek SSR to unite financial and material efforts for setting up a republic network of data transmission;

to do the utmost to extend and deepen the departmental curriculum for retraining specialists in the field of cybernetics.

The materials of the seminar-conference were prepared for publication by the science editor of "Ekonomika i zhizn'," Yu. Modestov.

COPYRIGHT: "Ekonomika i zhizn'", 1978

6610

CSO: 1870

## CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY

### AUTOMATION OF DESIGN AND CONSTRUCTION PROJECTS

Leningrad LENINGRADSKAYA PRAVDA in Russian 27 Jul 78 p 2

[Article by Candidate of Technical Sciences G. Lastovkin, Director of Lengiproneftekhim Institute, and M. Mel'nikov, section chief: "Working Day of Computers"]

[Excerpts] Our institute has had its own computer center and a department involved in problems of design automation for 7 years now. Within a year we carry out more than 4,000 calculations and other operations by programs which permit complex development of the most complex designs.

Last year labor expenditures for design using computers were reduced by 5,700 hours. The periods of completing the main parts of the design were reduced by 10 percent.

Computer calculation of only one subassembly of a large installation for preliminary petroleum refining made it possible to reduce capital and operating expenses by 90,000 rubles annually by refining the mode.

We have also solved the problem of optimization of commercial production of the petroleum refining products by using a computer. The machine has helped us find the variant which increased production of high-quality fuel by almost 10 percent. And this without expansion of plant capacities.

Despite the more compressed deadlines, we have been able to make decisions on the basis of analyzing several variants. At the same time the number of technicians involved directly in design was reduced by one-third during the past 7 years. Freeing a number of qualified specialists permitted us to expand the department involved in design automation and also to organize such services as an author's inspectorate group and group for generalizing design experience.

Thus, there is now no doubt of any kind about the need to have a computer center in a planning institute. The matter is different in deficiencies which interfere with increasing the utilization factor of computers in

planning. One of them (the most typical one) has been discussed for a long time and unfortunately without results. We have in mind the unsatisfactory supply of supplementary and auxiliary equipment for computers, spare sub-assemblies, parts and devices. The plants deliver computers consisting of a minimum number of devices and this is why the consumers themselves are usually involved in expanding the set for implementing all the abundant capabilities of the machine.

According to orders of the ministries, the supplementary equipment for computers is being expanded by Soyuzglavpribor [expansion unknown] of Gosstab of the USSR. But there are a number of ministries, including ours, to which the indicated procedure is somehow not being applied. The enterprises of these ministries are being equipped by the territorial administrations of Gosstab of the USSR, which do not assist in any way with the existing shortage of supplementary equipment. For example, our institute has been unable for the 8th year now to receive supplementary magnetic tape stores, punch tape and punch card input devices, printout devices and other needed equipment. And what is the result?

When a malfunction occurs, the machine generally stands idle due to an absence of standby devices and spare parts.

The low utilization factor of computers is explained by other factors as well. For example, by the constant shortage of electronic engineers, mechanical engineers, programmers and operators. It is no secret that the young engineers completing the educational institutions in these specialties are almost never sent to the planning institutes.

It is our deep conviction that the organizational base of presently existing algorithm and program stocks, which operate by the branch principle, is in itself essentially defective. A cost-accounting organization with its own computer center is what the Leningrad planners now need, we feel. It would be able not only to calculate instructions to programs or a description of them, but also to teach specialists to use these programs and to render technical assistance in introduction.

Talking about creation of such a cost-accounting territorial organization, we proceed on the basis of the specifics of planning institutes. Unlike scientific research institutes and design offices, we have a great commonality of planning problems, methods and procedures for solving them independently of branch affiliation. And this means that there is much in common in automation of those parts of the plan such as construction, sanitary engineering and electrotechnical. There should not be the situation when each planning institute of Leningrad sends its specialists on temporary duty to Moscow or to Kiev to acquire, let us say, an automated system and construction calculations, or to Minsk or Odessa to obtain a system for automated estimate compilation programs. Of course, the Leningrad House of Scientific-Technical Propaganda and scientific-technical societies could play an important role in coordination of the work, in procedural management and technical



assistance. Permanently operating seminars must apparently be created on their basis.

The computer load norms, during fulfillment of which each enterprise having a machine is reported to the organizations of TsSU [Central Statistical Administration] of the USSR, have been introduced in our country since 1974. For example, for our institute the mean daily load of the "Minsk-32" should comprise no less than 10 hours, that is, the computer should operate for 3,650 hours annually without regard to repair time, correction of malfunctions and preventive maintenance.

The norm is not easy and two-shift operation of the computers and sometimes weekend and holiday operation are required to observe it. However, our experience shows that the machine load during the first 5 years of operation for the institute's own needs reaches approximately 50-60 percent of the norm, while it almost reaches 70 percent 2 years later.

It would seem that the computer centers can provide the lacking load up to normal by leasing machine time to other organizations.

Actually, for computer centers operating on an independent budget, sale of machine time is planned by superior organizations with allocation of the limits required for this in labor, material stocks and spare parts. A profit is also planned for them and there is a norm for deducting to the economic incentives funds from the profit. The mechanism is somewhat different in scientific research organizations and design offices: they formulate sale of machine time as fulfillment of scientific research work, include these operations in their topical plans and are thus economically interested in fulfilling them.

The situation is quite different in planning institutes where the volume and cost of all types of work are strictly regulated. For them, sale of machine time has nothing in common with planning and therefore is naturally not included in topical plans. It is true that if the institute is operating poorly and is not fulfilling the plan on profits due to planning, it may compensate for this by sales of machine time. But what if the institute is operating well? And what if the profit plan is being fulfilled by the main activity? This is the case when sale of machine time yields nothing to the institute since it is not taken into account anywhere.

Such an institute is not economically interested in increasing the computer load. That is why the computer load plans which all computer centers now compile and which, upon coordination with TsSU SSSR, are confirmed by the ministries and are purely formal in nature. They have not been reinforced with any limits and funds whatever and are not a constituent part of the topical plans of the planning institutes. It is felt that neither circulars nor formal plans are capable of fundamentally altering the existing situation with the low computer load.

6521

CSO: 1870

## SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

ANNUAL GENERAL MEETING OF THE TURKMEN SSR ACADEMY OF SCIENCES (6 Apr 1978)

Ashkhabad IZVESTIYA AKADEMII NAUK TURKMENSKOY SSR: SERIYA FIZIKO-TEKHNICHESKIKH KHIMICHESKIKH I GEOLOGICHESKIKH NAUK in Russian No 3, 1978 pp 124-128

/Article by N.I. Nemirova/

/Text/ The annual General Meeting of the Turkmen SSR convened in Ashkhabad. Participants included secretary of the Central Committee of the KPT /Turkmenistan Communist Party/ M.M. Mollayeva, head of the section of sciences and educational institutions of the Central Committee of the KPT Ye.O. Ovlyakuliyev, director of the Turkmen branch of the Institute of Marxism-Leninism at the Central Committee of the CPSU R.M. Karryyeva, deputy chairman of Gosplan TSSR A.B. Perengliyev, secretary of the Ashkhabad Regional Committee of the KPT O.I. Bocharov and others.

In his opening address, president of the Academy of Sciences TSSR, corresponding member of the AS USSR A.G. Babayev noted some of the achievements of the Turkmen Academy of Sciences as it approached the 60th Anniversary of the October Revolution and the adoption of the new Constitution of the USSR.

Collectives of individual institutions have achieved successes and gained victories in socialist competition for a worthy reception of the 60th Anniversary of the October Socialist Revolution. The Institute of Chemistry was awarded the challenge Red Banner of the Central Committee of the KPT, the SM /Council of Ministers/ TSSR, the TSPS /Turkmen Republic Council of Trade Unions/ and the Central Committee of the LKSMY /Lenin Young Communist League of Turkmenistan/. The Institute of Languages and Literature imeni Maktumkul was registered in the Book of Labor Glory of the AS TSSR and the RK /Workers and Peasants/ Trade Union of educational workers, colleges and scientific institutions. The Order of the Red Banner Desert Institute was awarded the challenge Red Banner of the AS TSSR. For successes in socialist competition of 1977, 12 construction subdivisions of scientific institutions and the TsNB /expansion unknown/ of the AS TSSR were awarded

honorary diplomas of the Presidium, the Party Committee, the OMK /expansion unknown/ of the Trade Union of the AS TSSR.

Chief scientific secretary of the Presidium academician of the AS TSSR, F.F. Sultanov, presented the speech "The Activity of the AS TSSR in 1977" which explained the results of important fundamental and applied research.

The scientific-organizational work of the Presidium of the AS TSSR was directed toward the realization of plans, set for the 10th Five-Year Plan, under the slogan advanced by the 25th Congress of the CPSU (an increase of effectiveness and quality). For this purpose, measures were developed in accordance with the decree of the Presidium of the AS USSR of 24 March 1977 "Main Trends of Research and Prospects of Development of the AS TSSR" and the experience of the work of the AS UkSSR and the Siberian Department of the AS USSR.

Special attention was given to problems of improving planning. The theme of the scientific research studies was presented in conformity with investigations whose trends were confirmed by the AS USSR, with consideration of problems of development of economics and culture of the republic. The intra-academy comprehensiveness of research was improved. Automation of scientific experiments and processing of their results were used more widely.

One of the most important aspects of the work of the AS TSSR involves problems of strengthening the connection of science and production. According to results of investigations, there was introduced or prepared for introduction into the National Economy 24 recommendations and 16 author's certificates on new technical solutions were obtained.

The section of physico-technical and chemical sciences is continuing important work on the improvement of plans of introduction.

Organization of joint studies of the academy and individual ministries were started. Thus, at the Institute of Chemistry of the AS TSSR, there is being created a sectoral scientific laboratory of the Ministry of the Chemical Industry of the USSR; the ministry is financing it and the institute is carrying out the scientific and methodical leadership. The creation of such laboratories will facilitate acceleration of introduction of the achievements of science into the National Economy.

Closer contacts are being maintained with industrial organizations. The Institute of Chemistry of the AS TSSR has concluded economic agreements and contracts concerning creative collaboration on conducting experimental-industrial tests at the site of enterprises of the republic such as the "Karbogazsul'tata" combine, the Cheleken chemical plant, the Gaurdak sulfur combine, etc. Support points are being created for the introduction of

developments by the Institute of Chemicals at production sites and at the point already created in the settlement of Bekdash and organization of them planned in Gaurdak and Cheleken.

The Physical-Technical Institute maintains communication with several design institutes and industrial organizations concerning problems of design and preparation of solar apparatus and semiconductor devices (Giprovdokhoz of MM /expansion unknown/ and the VKh USSR, the Board of "Karakumstroy," reinforced concrete structure plants, "The Red Metallist" and others.

Institutes of biological specialties are conducting experimental production checking of results of studies in the fields of kolkhozes and sovkhozes of the republic (the Soviet Turkmenistan" kolkhoz and the "Pyt' Leninism" sovkhoz and others).

Measures by the Presidium and sections of the AS TSSR have facilitated the total fulfillment of the 1977 scientific research plan.

In the area of use of solar energy, studies have been conducted which permit the increase of the effectiveness of parabolic-cylindrical concentrators made from foam polyurethane with good technical and economic characteristics and data for design have been published.

A procedure for technical-economic design was developed and the economic effectiveness of a solar distilling device for pasture water supply was substantiated. There were determined technical-economic indicators and areas of effective use of solar distillers, solar greenhouses, solar water heaters and solar refrigerators in sectors of the National Economy of the republic.

Study of semiconductors were completed by development of highly efficient photo-electric transformers based on developed varizonal gallium-aluminum arsenic p-n-structures.

Efficient film magnetosensitive transformers have been developed and a control device for null sequence of current and a gauge of weak pulsed magnetic fields was developed.

As a result of acoustics research, there were formulated basic principals of phenomena of propagation of ultrasound in media with high viscosity.

Radiophysicists have produced new experimental data.

For the first time in our country there was discovered the basal spectra of meteor trails which permitted a more profound study of the photochemical processes of the upper atmosphere.

Seismologists evaluated the seismic danger in Turkmenistan territory. A regional scale of increments of seismic intensity for Turkmenistan was completed and this permits evaluation of the seismicity of soil conditions of individual sections.

Chemists have established that condensates of southeastern Turkmenistan deposits are a promising raw material for producing liquid paraaffins.

Determinations have been made of the chemical composition of iodobromine waters of western Turkmenistan, Bakin and Novo-Troitsk deposits which are basic to the development of the technological schemes of removing organic admixtures from the waters and predicting the oil resources of the region. Methods of purification and complex use of sewage from Cheleken, Nebit-Dag iodobromine plants and Chardzhuy superphosphate plant of TSSR were developed.

Desert specialists have compiled a geobotanical, geomorphological, pastoral, soil, erosion map of the Turkmen SSR territory on a 1 to 1 million scale.

The overall chemical composition of soils and chemical-mineralogical composition of the finely dispersed phase of serozem and cinnamon soils of mountainous Kopet Dag were studied.

A detailed study was made of basic pastoral plants of Kara-Kum to determine the levels of organic and mineral nutrients. The fodder balance in pastoral animal husbandry was developed further. Recommendations were made concerning norms of protein-vitamin-mineral fattening of sheep pasturing in the Kar-Kums.

Botanists have studied 226 species of plants, belonging to 58 genera and 9 families. Six new (for Turkmen) species of chenopodium and buckwheat were established. The complex characteristics of the plant cover of the desert plain of southwestern Turkmenistan was compiled.

Zoologists studied the species composition and ecology of basic species of entomofauna on newly opened lands of southwestern Turkmenistan.

Physiologists developed a method of accelerated adaptation of persons which ensured an increase of their resistance to heat and efficiency at the high temperature of that area.

Scholars of the Department of the Social Sciences completed, in the year under review, 11 monographic studies devoted to different problems of the process of development of the TSSR.

Economists prepared and sent to directive and planning agencies of the republic, materials on basic trends of development of the National Economy of Turkmenistan SSR in the long range and also some scientific memoranda

including "Vital Problems of the Increase of Effectiveness of Public Production," "The National Income and Factors of Its Growth," "Basic Trends of Rational Use of the Labor Resources" and others.

Important scientific work and propaganda activity were conducted by scientists of scientific institutions of the humanitarian specialty for the Jubilee of the October Revolution and the adoption of the new constitution.

In conclusion F.F. Sultanov discussed problems posed for science by the 25th Congress of the CPSU and the 21st Congress of the Turkmenistan Communist Party. This places primary emphasis on the expansion and deepening of studies of regularities of the development of nature and society, the increase of the contribution of science to the solution of vital problems of construction of the materials and supply base of Communism.

Participants in discussion of the report included academicians of the AS TSSR I.S. Rabochev, A.M. Niyazov, corresponding member of the AS TSSR V.T. Lavrinenko, deputy minister of health of the TSSR M.M. Soyunov, head of the Department of Science of MSKh Ministry of Agriculture of the TSSR Kh.O. Orazmuradov, director of the Institute of Seismology of the AS TSSR M.K. Kurbanov.

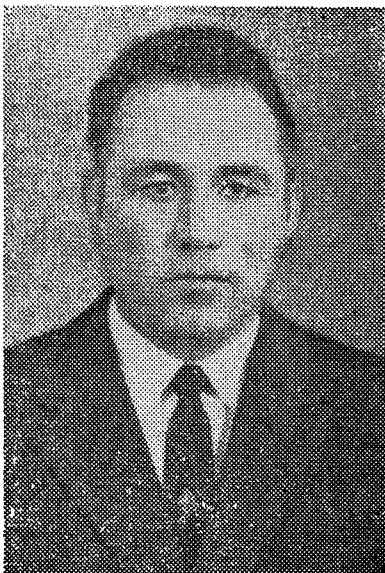
The general meeting approved the report of the activity of the AS TSSR for 1977 with consideration of the remarks and suggestions coming from the discussions.

In conclusion, Doctor of Art Studies V.M. Masson delivered the address "The Southern Turkmenistan Center of Ancient Eastern Civilization."

#### A New Generation of the Academy of Sciences of TSSR

The Academy of Sciences TSSR, on 20 November 1977, announced selection of active members (academicians) and corresponding members. To vacancies announced by Councils of Scientific Institutions and Colleges, government and public organizations, active members and corresponding members of Academy of Sciences, the AS TSSR registered 2 candidates for active membership (academicians) and 3 corresponding members to the AS TSSR.

Ovezgel'dyyev Orazgel'dy (radiophysics). He was born in 1936, is a Doctor of Physico-Mathematical Sciences, corresponding member of the AS TSSR, vice-president of the AS TSSR, academicians-secretary of the Department of Physico-Technical and Chemical Sciences, a specialist in the physics of the ionosphere and near-earth cosmic space and the author of more than 100 scientific studies.



His researches in the physics of anomalous phenomena in near-earth (ionosphere) plasma received wide recognition. He obtained unique experimental data on the fine structure and revealed regularities of movement of the sporadic E-layer and established basic principles of time-space variations of this complex anomalous phenomenon of the ionosphere.

He developed a photochemical theory of metallic ions which concurs closely with results of direct rocket measurements. The results of his studies on the physics of the turbopause are of great significance.

Tashliyev Shamurad (History of CPSU). He was born in 1913, Doctor of Historical Sciences, corresponding member of the AS TSSR, director of the Institute of History imeni Sh. Batyrov of the AS TSSR.

The basic trend of his scientific work involves the history of the struggle of the Communist Party for power to the Soviets in Central Asia, mainly in Turkmenistan. He is the author of more than 50 scientific works, including major monographs such as "Establishing and Strengthening the Soviet Power in Turkmenistan," "The Civil War and English Intervention in Turkmenistan" in 2 volumes and others. As an author or member of the editorial board, he participated in the creation of the "History of Soviet Turkmenistan," the 1st and 2d editions of "An Outline of the History of the Communist Party of Turkmenistan," "History of Communist Organizations of Central Asia" and some other scientific works and collections.





Agayev Yazdzhhan (Physics of Semiconductors and Semiconductor Energy Transformers). He was born in 1933, Doctor of Physico-Mathematical Sciences, head of the Department of the Physics of Semiconductors of the Physico-Technical Institute of the AS TSSR, leading specialist in the republic in the area of the physics of semiconductors and semiconductor energy transformers. He is the author of more than 100 scientific studies.

The complex of his research in electrical, galvano-thermomagnetic, thermoelectric, optical, photoelectrical and photomagnetic properties of some  $A^3B^5$  compounds and solid solutions based on them constituted a significant contribution to the understanding of processes occurring in these crystals.

The basic research of crystals with high mobility of the charge carriers revealed the short-circuiting effect of different factors on the kinetic coefficients, which served as a basis for the development of some new (in principle) devices and apparatus. He obtained certificates of authorship for three of these.

Annanepesov Murad (History of the USSR). He was born in 1932, Doctor of Historical Sciences, head of the Department of History of the Pre-October Period of the Institute of History imeni Sh. Batyrov of the AS TSSR, a specialist in the history of Turkmenistan and Central Asia in the 18th-19th and beginning of the 20th Century, author of 40 studies, including major monographic studies "Participation of the Soldiery in the 1905-1907 Revolution in Turkmenistan" and the Turkmen Economy in the 18th-19th Centuries" and others.

He has written several original studies on the historical services of the rural commune at the late stage of its development which elicited great comment and approval.

He is one of the authors of several chapters of a 4-volume study of the history of the peoples of Central Asia and Kazakhstan.





Masson Vadim Mikhaylovich (Archeology).  
He was born in 1929, Doctor of Historical Sciences, Professor, head of the Central Asia and Kazakhstan sector of the Leningrad Section of the Institute of Archeology of the AS USSR.

He is one of the leading specialists in the area of the ancient history of Central Asia and the Near East. He is the author of more than 250 studies of the history and archeology of Turkmenistan, Uzbekistan, Afghanistan. He received wide acclaim for his fundamental monographic studies: "Central Asia and the Ancient East," "Economics and Social Structure of Ancient Societies," the "Country of a Thousand Towns" and others.



Especially significant among his studies is his study of excavations of Altyn-dep where there were found outstanding art productions and monumental architecture, which permit posing the question of finding, in Turkmenistan, the most ancient, ancient-eastern type of civilization on our country.

COPYRIGHT: Izdatel'stvo "Ylym". "Izvestiya Akademii nauk Turkmenskoy SSR, seriya fiziko-tekhnicheskikh, khimicheskikh i geologicheskikh nauk," 1978

2791

CSO: 1870

END